Study on the Effect of Area Division Policy on Land Price: A Case in Saitama Prefecture

Waseda University Student Member ○ Pan Qiaoyu
Waseda University Regular Member 佐々木邦明

1. BACKGROUND

Area Division policies, including the Urbanization Promotion Area (UPA), have become important methods for developed countries to achieve orderly development. Japan's Urban Planning Act of 1968 has stipulated the Area Division by setting up UPAs inside the urban land, where urban development is promoted or encouraged. UPA is considered to promote development within it and to slow down development out of it. In addition, as the government gives priority to providing roads, facilities, and public services inside UPAs, the land price will also be affected. This study takes Saitama prefecture as a case, combined with various factors that may affect land price, trying to explore whether UPA has a significant impact in land price through regression analysis.

2. DATA AND METHOD

This study uses the datasets of UPA boundary and land price in 2020 in Saitama Prefecture from the Ministry of Land, Infrastructure, Transport and Tourism (MLIT). The land price data contains space information that can be located in the map, and it also includes other information like land size, Floor Area Ratio (FAR), building density, etc. There are totally 832 observations, with 681 inside UPAs, and 151 out of UPAs. The lowest price is 5,200 yen/m² and the highest price is 2,520,000 yen/m². In addition to the variables which can be extracted from the original datasets, two more factors should be considered regarding land price. According to the location theory, land price is greatly affected by its location in the city. The land closer to the CBD should be more expensive than the land far away. On the other hand, due to the influence and radiation of Tokyo as the national center in the south, the land closer to Tokyo should also be more expensive. The distance from each price point to the prefecture center and to the boundary of Tokyo are calculated by the software of ArcGIS, and the two variables as distance to CBD and distance to Tokyo are generated. (Table 1)

The basic equation of the model applies multiple ordinary least squares (OLS) regression. The resulting model is of the form

$$Y_i=\alpha_0+\beta_1 x_1+\beta_2 x_2+\beta_3 x_3+\ldots+\varepsilon \quad (1)$$

Where Yi is the natural log of land price, x1 is the UPA dummy, x2x3… are other land control variables, α0 is constant, β1β2β3 … are correlation coefficients, and ε is the error term.

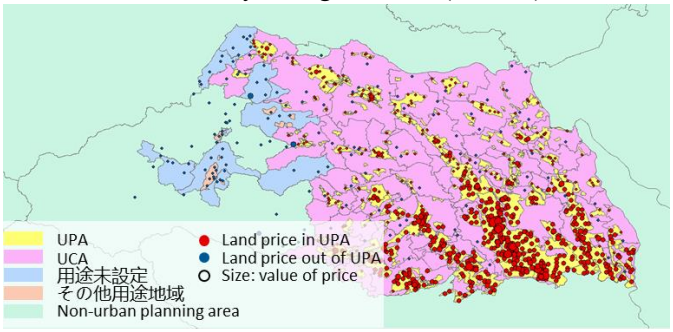

Figure 1. The distribution of land price in Saitama Prefecture

Table 1. Summary statistic table

Variable name	Description	Mean	Std. Dev.	Min	Max
logLP(dependent variable)	Natural log of land price	11.415	0.987	8.556	14.739
UPA	Land in UPA or not	0.818	0.385	0	1
logDC	Natural log of distance to CBD	4.219	0.359	2.595	4.844
logDT	Natural log of distance to the boundary of Tokyo	3.951	0.507	1.738	4.603
area	Land size	612.152	1934.393	61	19641
floor	Floor of the house	2.201	1.119	0	10
density	Building density	59.326	13.772	0	80
FAR	Floor Area Ratio	192.379	89.788	0	600
dis_rail	Distance to the rail station	1779.299	2084.738	0	20000
gas	Has gas or not	0.722	0.448	0	1
sewer	Has sewer or not	0.838	0.367	0	1

Table 2. Results of multiple regression

Independent variable	Model1	Model2
UPA	0.580***	0.687***
	(0.0580)	(0.0671)
area	**7.36e-06**	**8.45e-05****
	(1.12e-05)	**(4.19e-05)**
c.UPA#c.area	**NA**	**-0.000104****
	NA	**(4.41e-05)**
logDC	-0.932***	-0.920***
	(0.0429)	(0.0422)
logDT	-0.586***	-0.577***
	(0.0336)	(0.0332)
floor	0.0983***	0.0831***
	(0.0193)	(0.0208)
density	-0.00528	-0.00571*
	(0.00326)	(0.00312)
FAR	0.00232***	0.00250***
	(0.000378)	(0.000397)
dis_rail	-6.44e-05***	-6.48e-05***
	(1.75e-05)	(1.58e-05)
gas	0.302***	0.294***
	(0.0379)	(0.0370)
sewer	0.201***	0.192***
	(0.0526)	(0.0522)
Constant	16.56***	16.43***
	(0.286)	(0.260)
Observations	831	831
R-squared	0.844	0.851

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

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Contact address: 3-4-1 Okubo, Shinjuku-ku, Tokyo 169-8555, Japan, Tel: 0352863398 Email: panqiaoy@toki.waseda.jp

3. RESULTS

A multiple OLS regression model is set to reveal mathematical relation between the land price and UPA dummy in Saitama Prefecture, with nine other related control variables and robust standard errors. The result is exported in Table 2. As shown in the result table, the coefficient of determination (R^2) is 0.844. The p-values are all less than 0.01 except for land size and building density, showing their significant correlations to land price. The UPA dummy variable is statistically significant, and the coefficient for the UPA dummy variable is 0.580, which in percentage terms translates to 78.6%. This indicating that in Saitama Prefecture in 2020, land prices inside the UPA are on average 78.6% higher than land prices outside the UPA.

Although land size is not significant in the basic OLS regression, there are several pieces of literature showing relations between land size and price, and UPAs influence the effect of land size on the land price. Mathur, S. (2014) set up a model with the variable created by the interaction of the UPA variable and the lot size variable, which measures the incremental effect of lot size on housing prices for the homes inside the UPA compared to the homes outside the UPA. Following the literature, the interaction effect of the UPA dummy on land size will be tested. The result shows this time both land size and the interaction effect of land size are significant. This means inside UPA the land size has a significant effect on the land price. All variables are statistically significant at 0.1 level, and the coefficient for the UPA dummy*land size variable is -0.0001, which means each 100 m^2 increase of land size inside UPA, the land price will have 1% more decrease than out of UPA.

The reason for the negative parameter might be that, inside the UPA, the unit land price is relatively high and people will have a heavy burden purchasing lands and houses, so they prefer to choose small lands for a lower total price. As a result, inference can be made that the UPA is triggering people's preference for small lands and promoting compact urban form, which is in accord with the UPA's intention.

Table 3. Results of regression with dataset of 2015

VARIABLES	Model2 (2020)	Model3 (2015)
UPA	**0.687*** **	**0.716*** **
	(0.0671)	**(0.0726)**
area	8.45e-05**	9.88e-05
	(4.19e-05)	(6.11e-05)
c.UPA#c.area	-0.000104**	-0.000124**
	(4.41e-05)	(6.23e-05)
logDC	-0.920***	-0.821***
	(0.0422)	(0.0421)
logDT	-0.577***	-0.539***
	(0.0332)	(0.0303)
floor	0.0831***	0.0927***
	(0.0208)	(0.0251)
density	-0.00571*	-0.00579*
	(0.00312)	(0.00328)
FAR	0.00250***	0.00228***
	(0.000397)	(0.000414)
dis_rail	-6.48e-05***	-6.43e-05***
	(1.58e-05)	(1.70e-05)
gas	0.294***	0.261***
	(0.0370)	(0.0388)
sewer	0.192***	0.175***
	(0.0522)	(0.0555)
Constant	16.43***	15.87***
	(0.260)	(0.271)
Observations	831	732
R-squared	0.851	0.848

4. ROBUSTNESS CHECK WITH DIFFERENT PERIOD

The previous regressions are conducted with cross-sectional data of 2020. The dataset of 2015 land price is used to conduct a robustness check. The model presents similar results. (Table 3) The UPA dummy variable is positive and statistically significant. However, from 2015 to 2020, the coefficient of the UPA dummy has dropped, showing the effect of Area Division policy on land price has weakened in recent years. It needs further research to figure out whether this is just a trend of land price, or the Area Division policy is getting weaker for its function of controlling urban sprawl and achieve orderly development.

5. CONCLUSIONS

This study measures the influence of Area Division policy on land price in Saitama Prefecture with multiple regression models. The model results show a significant and strong difference in land price inside and out of UPA, suggesting Area Division policy has a clear effect on land price in Saitama Prefecture. In addition, inside UPA the land size has a significant negative effect on the land price. Inference can be made that UPA is triggering people's preference for small lands and promoting compact urban form, and UPA has a good performance of maintaining compact development. Lastly, the different coefficients of the regressions using datasets from 2015 and 2020 show the effect of Area Division policy on land price might be weakened in recent years.

Although empirical evidence proves the positive impact of Area Division policy on house prices, indicating that Area Division policy has functioned well in controlling urban disorderly expansion, the effect of Area Division policy on house prices has decreased in the five years from 2015 to 2020. The local governments should conduct a comprehensive review of the policy every few years to examine whether the UPA is still suitable for the present urban development, and adjust the boundary of the UPA carefully based on the review results. As people tend to choose small lands inside UPAs, the local governments should support the development and renewal of small lands and houses to meet the residential demands of citizens. At the same time, the governments need to consider the impact of population concentration, increase the supply of public service facilities and strengthen the urban disaster prevention infrastructure, to improve the population capacity inside UPA.

REFERENCES

1. Mathur, S. (2014). Impact of urban growth boundary on housing and land prices: Evidence from King County, Washington. Housing Studies, 29(1), 128-148.